

In the Claims:

1. (currently amended) A cardiac pacing system for delivering electrical stimulation to at least three chambers of a heart, said at least three chambers including a left ventricular chamber and a right ventricular chamber, comprising:

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a timing circuit to measure at least one time interval, the at least one time interval operatively coupled being used to control delivery of the an electrical stimulation therapy to at least a left ventricular chamber and a right ventricular chamber by at the cardiac
pacing system;

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a sensing circuit to measure a duration of a QRS complex of a last-to-depolarize ventricular chamber of the heart; and

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a control circuit coupled to the timing circuit and the sensing circuit to adjust the length of the at least one time interval based on the measured duration of the QRS complex of the heart.

2. (currently amended) The system according to claim 1, wherein the sensing circuit includes a circuit to sense a depolarization in a selected one of the left or right atria of the heart, and wherein the at least one time interval further comprises includes an SAV delay initiated upon sensing of the depolarization, and further including comprising:

an output circuit coupled to the timing circuit to:

a) deliver a first ventricular pacing pulse to a first ventricular site disposed in a first ventricular chamber upon expiration of the SAV delay and a second ventricular pacing pulse to a second ventricular site disposed in a second ventricular chamber, wherein said second ventricular pacing pulse is delivered after a temporal interval following delivery of said first ventricular pacing pulse, or

b) upon detecting a ventricular depolarization in said first ventricular chamber prior to expiration of the SAV delay, withholding delivery of the first ventricular pacing pulse and delivering the second ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization, or

c) upon detecting a ventricular depolarization in said second ventricular chamber prior to expiration of the SAV delay, withholding delivery of the second ventricular pacing pulse and delivering the first ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization.

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3. (currently amended) The A system according to Claim 2, wherein the output circuit includes a circuit to deliver an atrial pacing pulse to the selected one of the left or right atria of the heart upon expiration of an V-A escape interval, and wherein the at least one time interval includes a PAV delay initiated upon delivery of the atrial pacing pulse, and wherein the output circuit includes further comprises a circuit to deliver the first ventricular pacing pulse to the first ventricular site upon expiration of the PAV delay.

4. (currently amended) TheA system according to Claim 2 or 3, wherein the output circuit includes a circuit to deliver a second ventricular pacing pulse to a second ventricular site, and wherein the at least one time temporal interval comprises includes a V-Vbi-ventricular delay elapsing between the first and second ventricular pacing pulses.

5. (currently amended) TheA system according to Claim 4, wherein the first ventricular chambersite is a location within the right ventricle of the heart and the second ventricular chambersite is a location within the left ventricle of the heart.

6. (currently amended) TheA system according to Claim 4, wherein the first ventricular chambersite is a location within the left ventricle of the heart and the second ventricular chambersite is a location within the right ventricle of the heart.

7. (currently amended) TheA system according to Claim 4, wherein the output circuit includes a circuit to deliver a pacing pulse to the other one of the left or right atria of the heart.

42. (currently amended) A method for use in a cardiac pacing system for optimizing delivery of therapeutic electrical stimulation to at least three chambers of a heart, said at least three chambers including a left ventricular chamber and a right ventricular chamber, comprising the methodsteps of:

(a) timing measuring at least one time interval between at least two of the following cardiac events:

an atrial depolarization event, an atrial pace event, a left ventricular depolarization event, a left ventricular pace event, a right ventricular depolarization event, a right ventricular pace event;

obtaining a presently enabled, programmable value of a one of: a sensed A-V interval, a paced A-V interval, a V-A escape interval;

(b) delivering a therapeutic electrical stimulation to a first atrial chamber followed by a first ventricular chamber and subsequently location in to a second ventricular chamber of the heart at a predetermined times relative to either the at least one time interval or the programmable value;

(c) for a given cardiac cycle, measuring a duration of a QRS complex duration of a last-to-depolarize ventricular chamber of the heart;

storing the measured QRS complex duration; and

(d) adjusting at the temporal length of the at least one time interval based on the measured duration of the QRS complex of the last-to-depolarize ventricular chamber of the heart.

43. (currently amended) TheA method according to Gclaim 42, and further comprising the stepmethod of:

sensing a depolarization in a selected one of thea left atria or a right atria of the heart;

and wherein the at least one time interval includes an SAV delay initiated from the occurrence of the sensed depolarization of the left atria or the right atria, and further comprising:wherein the

delivering therapeutic cardiac pacing electrical stimulation is delivered to the first ventricular chamber location in the heart upon expiration of the SAV delay.

44. (currently amended) The A method according to C claim 43, wherein the first ventricular chamber comprises location is a location within a selected one of the left or right ventricles.

45. (currently amended) The A method according to C claim 44, and further comprising the methods of wherein for a subsequent cardiac cycle,

delivering atrial electrical stimulation to the selected one of the left or right atria of the heart if the an atrial depolarization -is not sensed within a predetermined period time, delivering an atrial pacing stimulus to an atrial chamber following expiration of a V-A escape interval;

and wherein the at least one time interval includes an PAV delay commenced relative to the delivery of the atrial electrical stimulation, and wherein the delivery of therapeutic electrical stimulation to the first location in the heart occurs following expiration of a paced A-V intervalthe PAV delay.

46. (currently amended) The A method according to C claim 42, wherein the step of delivering a therapeutic electrical stimulation to a first atrial chamber followed by a first ventricular chamber and subsequently to a second ventricular comprises the first location is within the right or the left ventricle, and further comprising the method of delivering therapeutic electrical stimulation to the second ventricular chamber to a location within the other one of the left or right ventricles following expiration of the a V-V delay t least one time interval.

47. (currently amended) The A method according to C claim 44, and further comprising the method step of delivering electrical stimulation to the other one of the left or right ventricles following expiration of a V-V delay, wherein the V-V delay is one of the at least one time intervals.

48. (new) A computer readable medium for storing instructions for performing a method, comprising:

instructions for measuring at least one time interval, the at least one time interval being used to control delivery of an electrical stimulation therapy to at least a left ventricular chamber and a right ventricular chamber by a cardiac pacing system;

instructions for measuring a duration of a QRS complex of a last-to-depolarize ventricular chamber of a heart; and

instructions for controlling a timing circuit and a sensing circuit to adjust the length of the at least one time interval based on the measured duration of the QRS complex of the last-to-depolarize ventricular chamber of the heart.

49. (new) A computer readable medium according to claim 48, further comprising:

instructions to deliver a first ventricular pacing pulse to a first ventricular site disposed in a first ventricular chamber upon expiration of an SAV delay and a second ventricular pacing pulse to a second ventricular site disposed in a second ventricular chamber, wherein said second ventricular pacing pulse is delivered after a temporal interval following delivery of said first ventricular pacing pulse;

instructions to, upon detecting a ventricular depolarization in said first ventricular chamber prior to expiration of the SAV delay, withhold delivery of the first ventricular pacing pulse and deliver the second ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization; and

instructions to, upon detecting a ventricular depolarization in said second ventricular chamber prior to expiration of the SAV delay, withhold delivery of the second ventricular pacing pulse and deliver the first ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization.

50. (new) A system for providing cardiac pacing therapy to at least three chambers of a heart, comprising:

means for measuring at least one time interval, the at least one time interval being used to control delivery of an electrical stimulation therapy to at least a left ventricular chamber or a right ventricular chamber by a cardiac pacing system;

means for measuring a duration of a QRS complex of a last-to-depolarize ventricular chamber of a heart; and

means for controlling a timing circuit and a sensing circuit to adjust the length of the at least one time interval based on the measured duration of the QRS complex of the last-to-depolarize ventricular chamber of the heart.

51. (new) A system according to claim 50, further comprising:

means for delivering a first ventricular pacing pulse to a first ventricular site disposed in a first ventricular chamber upon expiration of an SAV delay and a second ventricular pacing pulse to a second ventricular site disposed in a second ventricular chamber, wherein said second ventricular pacing pulse is delivered after a temporal interval following delivery of said first ventricular pacing pulse;

means for, upon detecting a ventricular depolarization in said first ventricular chamber prior to expiration of the SAV delay, withholding delivery of the first ventricular pacing pulse and delivering the second ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization; and

means for, upon detecting a ventricular depolarization in said second ventricular chamber prior to expiration of the SAV delay, withholding delivery of the second ventricular pacing pulse and delivering the first ventricular pacing pulse after a temporal interval following detection of said ventricular depolarization.